



TENNESSEE DEPARTMENT OF

EDUCATION
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Engineering Practicum

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| Primary Career Cluster: | Science, Technology, Engineering, and Mathematics (STEM) |
| Consultant: | Bethany King Wilkes, (615) 532-2844, Bethany.Wilkes@tn.gov |
| Course Code: | TBD |
| Prerequisite(s): | <i>Engineering II; Algebra I; Physical Science; and Biology or Chemistry</i> |
| Credit: | 1 |
| Grade Level: | 12 |
| Graduation Requirement: | This course satisfies one of three credits required for an elective focus when taken in conjunction with other STEM courses. |
| Programs of Study and Sequence: | This is the fourth course in the <i>Engineering</i> program of study. |
| Necessary Equipment: | Refer to the equipment list found on the STEM website linked below. |
| Aligned Student Organization(s): | Skills USA: http://www.tnskillsusa.com Brandon Hudson, (615) 532-2804, Brandon.Hudson@tn.gov Technology Student Association (TSA): http://www.tntsa.org Amanda Hodges, (615) 532-6270, Amanda.Hodges@tn.gov |
| Coordinating Work-Based Learning: | If a teacher has completed work-based learning training, appropriate student placement can be offered. To learn more, please visit http://www.tn.gov/education/cte/wb/ . |
| Available Student Industry Certifications: | None |
| Dual Credit or Dual Enrollment Opportunities: | There are no known dual credit/dual enrollment opportunities for this course. If interested in developing, reach out to a local postsecondary institution to establish an articulation agreement. |
| Teacher Endorsement(s): | 013, 014, 015, 016, 017, 018, 047, 070, 078, 081, 210, 211, 212, 213, 214, 413, 414, 415, 416, 417, 418, 230, 231, 232, 233, 470, 477, 519, 531, 595, 596 |
| Required Teacher Certifications/Training: | Teachers who have never taught this course must attend training provided by the Department of Education. |
| Teacher Resources: | http://www.tn.gov/education/cte/doc/STEMResourceList.pdf |

Course Description

Engineering Practicum is a capstone course intended to provide students with the opportunity to apply the skills and knowledge learned in previous *Engineering* courses within a professional, working environment. In addition to developing an understanding of the professional and ethical issues encountered by engineers and technologists in the workplace, students learn to refine their skills in problem solving, research, communication, data analysis, teamwork, and project management. The course is highly customizable to meet local system needs: instruction may be delivered through school laboratory training or through work-based learning arrangements such as internships, cooperative education, service learning, mentoring, and job shadowing. Upon completion of the practicum, students will be prepared for postsecondary study in engineering and technology fields. Standards in this course are aligned with Tennessee Common Core State Standards for English Language Arts & Literacy in Technical Subjects and Tennessee Common Core State Standards in Mathematics.*

Note: Mastery of the following standards should be attained while completing an engineering design project in a practicum setting. Students are expected to use engineering notebooks to document procedures, design ideas, and other notes for the project throughout the course. The project should follow the engineering design process learned in previous courses. Moreover, practicum activities may take the form of work-based learning opportunities (such as internships, cooperative education, service learning, and job shadowing) or in-class projects, depending on local availability. Work-based learning opportunities must follow policies outlined in the work-based learning guide found online at <http://www.tn.gov/education/cte/wb/doc/WorkBasedLearningPoliciesApril2013.pdf>.

Program of Study Application

This is the fourth course in the *Engineering* program of study. For more information on the benefits and requirements of implementing this program in full, please visit the STEM website at <http://www.tn.gov/education/cte/ScienceTechnologyEngineeringMathematics.shtml>.

Course Standards

Safety

- 1) Accurately read and interpret safety rules, including but not limited to rules published by the National Science Teachers Association (NSTA), rules pertaining to electrical safety, Occupational Safety and Health Administration (OSHA) guidelines, and state and national code requirements. Be able to distinguish between the rules and explain why certain rules apply. (TN CCSS Reading 3, 4, 6)
- 2) Identify and explain the intended use of safety equipment available in the classroom. For example, demonstrate how to properly inspect, use, and maintain safe operating procedures with tools and equipment. (TN CCSS Reading 3, 4)

Career Exploration

- 3) Develop an informational annotated document, linked to bookmarked websites, illustrating the opportunities for students to investigate and experience engineering and technology while in



school, focusing specifically on those programs offered by colleges and universities in Tennessee. For example, opportunities include job shadowing, internships, co-op programs, volunteer and community service, and part-time employment. (TN CCSS Reading 5, 7, 9; TN CCSS Writing 2, 4, 6, 8)

Employment Research and Preparation

- 4) Research and select a company or organization for a work-based learning project in an engineering or technology area of choice. Cite specific textual evidence from the organization's literature, as well as independent news articles to summarize:
 - a. The mission and history of the organization
 - b. Headquarters and organizational structure
 - c. Products or services provided
 - d. Credentials required for employment and how they are obtained and maintained
 - e. Policies and procedures
 - f. Reports, newsletters, and other documents published by the organization
 - g. Website and contact information(TN CCSS Writing 4, 7)
- 5) Search for the resumes of engineers and technologists retrieved from the websites of institutions, organizations, or professional networks. Discuss what is typically included in the resumes of engineering and technology professionals, compare and contrast several examples, and create a personal resume modeled after elements identified in the search. (TN CCSS Reading 1, 4, 5, 6; TN CCSS Writing 4)
- 6) Conduct a job search and simulate the experience by researching local employment options. In preparation for a future career in engineering or technology, complete an authentic job application form and compose a cover letter following guidelines specified in the vacancy announcement. (TN CCSS Reading 7; TN CCSS Writing 4)
- 7) Participate in a mock interview. Prior to the interview, prepare a paper that includes the following: tips on dress and grooming, most commonly asked interview questions, appropriate conduct during an interview, and recommended follow-up procedures. Upon completion of the interview, write a thank you letter to the interviewer in a written or email format. (TN CCSS Reading 2; TN CCSS Writing 2, 4, 7, 9)

Transferring Course Concepts to Practicum

- 8) Apply skills and knowledge from previous courses in an authentic work-based learning internship, job shadow, or classroom-based project. Where appropriate, develop, practice, and demonstrate skills outlined in previous courses. (TN CCSS Reading 2, 3)
- 9) Identify a problem faced by a local organization or company to define a project proposal. Incorporate organization or company interviews into the research, as well as engineering concepts from the prior three courses. Prepare a written project proposal including the problem definition; justification for why the problem is important to solve; design statement; criteria; constraints; information obtained through research; and deliverables. (TN CCSS Reading 3, 4, 7, 9; TN CCSS Writing 1, 5, 7)



10) Create and continually update a personal journal to document skills learned during the practicum and draw connections between the experience and previous course content by reflecting on:

- a. Tasks accomplished and activities implemented
- b. Positive and negative aspects of the experience
- c. How challenges were addressed
- d. Team participation in a learning environment
- e. Comparisons and contrasts between classroom and work environments
- f. Interactions with colleagues and supervisors
- g. Personal career development
- h. Personal satisfaction

(TN CCSS Writing 2, 4)

Portfolio

11) Create a portfolio, or similar collection of work, that illustrates mastery of skills and knowledge outlined in the previous courses and applied in the practicum. The portfolio should reflect thoughtful assessment and evaluation of the progression of work involving the application of steps of the engineering design process (depending on the nature of the work-based learning project). The following documents will reside in the career portfolio:

- a. Career and professional development plan
- b. Resume
- c. List of responsibilities undertaken through the course
- d. Examples of visual materials developed and used during the course (such as graphics, drawings, models, presentation slides, videos, and demonstrations)
- e. Description of technology used, with examples if appropriate
- f. Periodic journal entries reflecting on tasks and activities
- g. Feedback from instructor and/or supervisor based on observations

(TN CCSS Writing 4, 5)

Communication of Project Results

12) Apply all steps of the engineering design process to successfully generate a prototype, collect the relevant data, perform the necessary tests, interpret the results, make modifications to models or prototypes, and communicate results over the course of the project's duration. Produce a technical report documenting the findings of the project and justifying the final conclusions based on evidence obtained. (TN CCSS Reading 1, 2, 3, 4, 5, 7, 8, 9; TN CCSS Writing 1, 2, 4, 5, 6, 7, 8, 9)

13) Upon completion of the practicum, develop a technology-enhanced presentation showcasing highlights, challenges, and lessons learned from the experience. The presentation should be delivered orally, but supported by relevant graphic illustrations, such as diagrams, drawings, and models of project findings, and/or physical artifacts that represent the outcome of the project (i.e., a prototype or 3-D model). Prepare the presentation in a format that could be presented to both a technical and a non-technical audience, as well as for a career and technical student organization (CTSO) competitive event. (TN CCSS Reading 1, 3, 7, 9; TN CCSS Writing 2, 4, 5, 6, 9)



Standards Alignment Notes

*References to other standards include:

- TN CCSS Reading: [Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects](#); Reading Standards for Literacy in Science and Technical Subjects 6-12; Grades 11-12 Students (page 62).
 - Note: While not directly aligned to one specific standard, students who are engaging in activities outlined above should be able to also demonstrate fluency in Standard 10 at the conclusion of the course.
- TN CCSS Writing: [Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects](#); Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects 6-12; Grades 11-12 Students (pages 64-66).
 - Note: While not directly aligned to one specific standard, students who are engaging in activities outlined above should be able to also demonstrate fluency in Standards 3 and 10 at the conclusion of the course.
- TN CCSS Math: [Common Core State Standards for Mathematics](#); Math Standards for High School: Numbers and Quantity, Algebra, Functions, Geometry, Statistics and Probability.
 - Note: The standards in this course are not meant to teach mathematical concepts. However, the concepts referenced above may provide teachers with opportunities to collaborate with mathematics educators to design project-based activities or collaborate on lesson planning. While not aligned to one specific conceptual category, students who are engaging in the activities outlined above should be able to demonstrate quantitative, algebraic, functional, geometric, and statistical reasoning as applied to specific technical concepts. In addition, students will have the opportunity to practice the habits of mind as described in the eight Standards for Mathematical Practice.
- P21: Partnership for 21st Century Skills [Framework for 21st Century Learning](#)
 - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

